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ABSTRACT

The document outlines a course designed to train audiometric technicians who will conduct pure-tone conduction tests as part of a program on hearing conservation in noise. A minimum of two days is required for the completion of the course. The outline of the training program presents nine topics with an indication of the minimum time required for each topic. The topics include: (1) hearing conservation in noise (importance of hearing, objectives of training program, and the audiometric technician's responsibilities and limitations); (2) basic discussion of sound and its measurement (parameters of sound and definitions and description and use of sound measuring equipment); (3) basic anatomy and physiology of the ear (function of the three parts of the ear and disorders of the ear); (4) the audiometer (type, how it works, and calibration and care); (5) audiometric technique (instruction to subject and procedure, record keeping, audiometric scheduling, pitfalls to avoid, and supervised practicum); (6) review of practicum and further audiograms; (7) medico-legal aspects and films (compensation, discussion, and films); (8) hearing protection and fitting procedures (advantages of muffs and plugs and practicum in fitting procedures); and (9) examination and review. (Author/EC)

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GUIDELINES FOR A TRAINING PROGRAM FOR AUDIOMETRIC TECHNICIANS

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NATIONAL INSTITUTE OF EDUCATION

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NAS-NRC Committee on Hearing, Bioacoustics, and Biomechanics

WORKING GROUP 66

Report of Working Group 66.
Guidelines for a Training Program
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NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL
COMMITTEE ON HEARING, BIOACOUSTICS, AND BIOMECHANICS

GUIDELINES FOR A TRAINING PROGRAM FOR AUDIOMETRIC TECHNICIANS

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September 1973

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Foreword

This course is designed to train audiometric technicians who will conduct pure-tone air conduction tests as part of a program of Hearing Conservation in Noise. A minimum of two days is required for the completion of the course, and a minimum requisite time for each of the topics is indicated in the course outline.

Two basic readings should accompany the course: "An Approved Technique for Pure Tone, Air Conduction Audiometry" (Glorig, A., Chairman, CHABA Working Group 66), Appendix, and "A Guide for Industrial Audiometric Technicians (Am. Industrial Hygiene Association, 14125 Prevost, Detroit, Michigan 48227).

Other readings that are useful as background material for the course are:

1. "Guide for Conservation of Hearing in Noise," Subcommittee on Noise in Industry, Aram Glorig, M.D., 1966 Inwood Road, Dallas, Texas 75235.

2. Industrial Noise Manual, ($15.30), Am. Industrial Hygiene Association, 14125 Prevost, Detroit, Michigan 48227.

3. Glorig, A., Noise and Your Ear, Greene and Stratton, Inc., 1958.

4. Sataloff, J., Hearing Loss, Lippincott, New York, 1966.

5. "Guide for Industrial Audiometric Technicians," Employers Mutuals of Wausau, Wausau, Wisconsin, 1967.

6. "Industrial Noise and Hearing Protection," Employers Mutuals of Wausau, Wausau, Wisconsin.

In addition, pamphlets and brochures on audiometry are often provided by Audiometer Manufacturers and can be obtained on request.

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SPECIFICATIONS ON A TRAINING PROGRAM FOR AUDIOMETRIC TECHNICIANS IN HEARING CONSERVATION IN NOISE

F I R S T D A Y

TOPIC I. Hearing Conservation in Noise -- Introductory Statement (No less than 45 minutes)

A. Importance of Hearing

1. Social Aspects

a. The Meaning of Hearing Loss -- suggested demonstrations, any of the following:

(1) Zenith record: "Getting Through" Zenith Radio Corporation, 6501 West Grand Avenue, Chicago, Illinois 60635

(2) Harford record: "How They Hear" -- Gordon Stowe and Association, P.O. Box 233, Northbrook, Illinois

(3) Tape "Demonstration of Hearing Impairment" -- Price Filmakers, Inc., 3491 Cahuenga Boulevard, West, Suite 2, Hollywood, California 90028.

2. Economic and Legal Aspects

B. Objectives of Training Program

1. Valid Audiograms -- Medical, legal, and social reasons why a valid audiogram is requisite

2. Effective Ear Protection

3. Medical Follow-up

C. The Audiometric Technician's Responsibilities and Limitations: Should be able to produce a valid audiogram, to recognize when it is or is not valid, and to retake it when necessary. The physician only is to interpret the audiogram and to make a diagnosis from it.

TOPIC II. Basic Discussion of Sound and Its Measurement

(No less than 45 minutes)

A. Parameters of Sound and Definitions

1. Frequency (Contrast with Pitch)

2. Intensity (Contrast with Loudness)

a. Meaning of the Decibel and Attenuation

b. Three types of Intensity Measures

(1) SPL (Sound Pressure Level)

(2) HL (Hearing Level) -- ASA

(3) HL (Hearing Level) -- ANSI

B. Description and Use of Sound Measuring Equipment (Background information only, not intended to qualify for making noise measurements)

1. Sound Level Meter

a. Measurements

(1) "dBA" -- Its meaning and why it was chosen

(2) B scale

(3) C scale

2. Why Hazard is Associated with "dBA" and the Percentage Risk

3. Noise as a Masker of Signals

a. Sound-treated booth is the only acceptable environment for threshold testing because of the masking effect of background noise on pure tones

b. Sound-room specifications by ANSI can be checked by reference to manufacturer's tests

c. The audiometric technician must assume responsibility for making sure the test booth is used properly and inside ambient level is checked periodically.

TOPIC III. Basic Anatomy and Physiology of the Ear (No less than 45 minutes)

A. Function of the Three Parts of the Ear

1. Outer

2. Middle -- Including Eustachian Tube Function

3. Inner

B. Disorders of the Ear

1. Conductive Disorders and Audiograms

2. Sensorineural Disorders and Audiograms

3. Types of Audiograms and Purposes

a. Screening Audiograms

b. Diagnostic

TOPIC IV. The Audiometer (No less than 90 minutes)

A. Types

1. Manual

2. Automatic

B. How it Works -- Functional Parts of Audiometer Common to All

C. Calibration and Care

1. Daily -- Self-Measurement (Check audiometer on own ear)

2. Monthly -- Biological Calibration is obtained by testing 5 or 6 young female subjects (under 25) who will be available for recheck. Audiometer should be initially checked on this group when received, and the results recorded. Once a month, 2 or 3 of this group should be retested. If the average of their thresholds is 10 dB or more off at one frequency, or 5 dB off at three frequencies, the audiometer should be sent for physical calibration. (Don't make corrections for the difference.)

3. Yearly -- Physical Calibration should be obtained once a year, by a properly qualified service organization. Audiometer should be returned for calibration complete with earphone assembly, etc.

4. Care

a. Earphone Care

(1) Gentleness in Handling

(2) Clean Cushions with soap and water, lightly

b. Audiometer should be turned on in morning and left on all day. Do not switch on and off--it is harmful to the instrument

c. Trouble shooting check points

(1) Broken Cords

(2) Loose Phone Cushions

(3) Dirt in Grid of Earphone

(4) Tension of Headband

(5) Noise in Attenuator (listen to sound during dial changes)

(6) Self-recording audiometers -- The peak-to-peak excursions must be less than 15 dB to be valid

TOPIC V. Audiometric Technique (No less than 45 minutes, plus 2 hour practicum)

A. Instruction to Subject and Procedure -- Demonstrating Technique

B. Record Keeping

1. Recording Results by means of serial audiogram forms (Record thresholds roughly and then copy to serial; or cover up previous test results when recording)

2. Self-recording Tests -- Take last half of tracing, draw a line halfway between peaks and record to closest 5 dB

C. Audiometric Scheduling

1. "Base-line" Audiogram -- A baseline audiogram is one obtained at initial employment time, or at a time when the ears have been away from noise 14 to 48 hours.

These should be scheduled as follows:

a. Pre-Employment

b. When a Change of 15 dB or more occurs at any frequency

c. At Intervals designated by physician (e.g., every 6 years)

2. Routine Audiometric Monitoring -- Audiograms should be obtained at regular intervals (e.g., every two years), as specified by the physician

D. Pitfalls To Avoid

1. Subjects Observing the manipulation of the dials (seat at an angle)

2. Visual Clues such as facial expressions or eye movements by the tester

3. Poor placement and adjustment of headphones

a. Remove Obstructions such as glasses, hair, earrings; headphones should be placed and removed only by tester; subject should be cautioned not to touch phones

b. Earphone grid should be opposite ear aperture

4. Tinkering with headband pressure

5. Vague Instructions -- Give clear directions to respond to faintest sound

6. Rythmic Presentation of tone -- Vary both the inter-signal interval and the duration of tone presentation

a. No more than 2-1/2 seconds

b. No less than 1 second

7. Incomplete forms (Be sure to record all information such as age, sex, date, etc.)

8. Don't Turn Audiometer on and off -- leave on all day

9. Problems with tinnitis -- Break rhythm and pulse tones to avoid confusion with head noise

10. Noise Problems in Testing

a. If too many audiograms show drops at 500 Hz, or if jack panels on booth are loose, or if seals appear to be broken in booth, inform manufacturer. Seals should be inspected every 6 months

b. Instrument should be placed outside testing booth

11. Cord Interference -- Cords should be free from contact with subject

12. Over-long Testing -- 5-8 minutes is sufficient for test. If it takes longer than this, call back for later recheck. If suspicion of malingering, no hint should be given and patient should be referred

13. Interrupter Switch -- leave on <u>off</u> position on dial

E. Supervised Practicum -- (no less than 2 hours) -- Students are paired and rotate preferably no more than two to an audiometer. Instructors instruct up to 8 students who circulate among pairs. Both automatic and manual screening audiometers should be represented; these may be obtained by requesting students to bring their own

audiometers and/or inviting manufacturers to represent their instruments at the course. Approximately 6 complete audiograms can be done during this time.

TOPIC VI. Review of Practicum and Further Audiograms (No less than 2 hours)

A. At least another 6 audiograms should be made during this time

TOPIC VII. Medico-Legal Aspects and Films (No less than 90 minutes)

A. Compensation

1. Importance of audiogram base lines from which comparison can be made

2. Kinds of laws in various states

3. Formula for calculating percentage of loss

B. Discussion and Films (Films can be shown at this point, or they can be shown at other appropriate times during the courses as directed by the instructor, at his discretion)

1. Approved Films from Price Filmakers, Inc.*

a. Hear: It Takes Two -- The importance of hearing to man

b. Audiometric Techniques -- Demonstration of methods of obtaining audiograms

* Price Filmakers, Inc., 3491 Cahuenga Blvd., West, Suite 2, Hollywood, California 90028.

c. Ear Protection and Noise -- Personal ear protection for workers in high noise levels

d. Noise and Its Effects on Man -- Noise in Everyday Life and How it is Combatted

TOPIC VIII. Hearing Protection and Fitting Procedures (No less than 90 minutes)

A. Advantages of Muffs and Plugs

1. Cautions

a. Don't accept any that don't have an independent laboratory measurement report

b. "Amplitude Sensitive" devices are inappropriate for industrial use

B. Practicum in Fitting Procedures with Experience Fitting Different Types of Plugs

TOPIC IX. Examination and Review (No less than 90 minutes)

A certificate will not be issued until each participant has submitted the results of ten tests on ten indivudals, made at his testing location. This will ensure that an active testing program is going on, and that the trainee will be using his skills soon enough not to forget them.

A yearly refresher course of one day is recommended for each trainee.

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13. ABSTRACT

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